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6-26 METAL COMPONENTS IN SUSPENDED PARTICLES (REPORT NO. 8)

Atmospheric lead pollution has become a major social problem and studies of this problem are being pressed forward by all of the organizations that are concerned with public damage. As a result, there is now a good grasp of the states of such pollution. It is also believed that the principal emission source of the lead in the atmosphere is tetraethyl lead, which is the antiknock compound used in gasoline. Various steps, such as removing lead from gasoline, are being taken in the area of countermeasures. As is the case with other pollutants, however, atmospheric lead pollution concentrations are affected to a great extent by factors such as geographical conditions, weather conditions, etc. A great many problems in elucidating the mechanics of lead pollution remain. The writers collected suspended particulates with high volume air samplers, tape air samplers and cascade centripeters [Tr. Note: Phonetic in the original] in order to investigate the daily and hourly variations in atmospheric lead concentrations and particle diameter distributions. As they secured information which they believe to be significant in the elucidation of the mechanics of atmospheric lead pollution, they report on it below.

1. Survey Methods.

The high volume air samplers and the cascade centripeters were operated in accordance with the normal methods, the particulates collected on glass fiber filters (GF-81) and a determination of the lead made by spectrofluor-

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ometry. As a rule the samples were collected for 24 hours. For purposes of collection efficiency in collecting the lead with the tape air samplers, the filter used was Toyo filter paper, Type No. 5C in the form of rolls. The air was sampled at a rate of 15 l/min and the particles captured in the form of 32 mm φ spots. A determination of the lead was made by spectrofluorometry in order to measure the hourly variations in lead concentration.

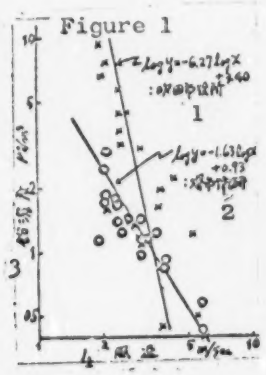
2. Survey Results.

As a result of sampling atmospheric lead concentrations continuously for a period of one month, it was found that the daily variations were very similar even between separated points with different surrounding environments. It can be said that this phenomenon can be explained adequately by taking into consideration weather conditions, particularly wind velocities. Fig. 1 shows the correlation between wind velocity and lead concentration at the Fukuda Municipal Offices where the traffic volume is relatively high and at the Sakai City Public Health Research Institute, which is located some distance from the roads. The gradient of the regression lines increases at the points where the traffic volume is high and it is evident that the lead concentration is affected to a marked degree by wind velocity. There is, in addition, also a danger that very high concentrations of lead pollution will develop when the winds are weak. Figs. 2 and 3 show the variations in lead concentration and wind velocity by the hour for the purpose of studying the effects of wind velocity on lead pollution concentrations. In general, a pattern of rising atmospheric lead concentrations around 0700 hours and falling concentrations from around 2000 hours is obtained. The curve varies generally like that of the hourly variations in automobile traffic. The effects of wind velocity on lead concentration are so great

that the lead concentration does not rise when the wind velocity is high even during the day when the traffic volume is high. Again, despite the fact that the automotive traffic volume drops at night, the lead concentration increases when the night wind velocity is low. It cannot be concluded, therefore, that the lead concentrations at night will always be lower than they are during the day. This is clear from the atmospheric lead measurements that were made with high volume air samplers during each eight-hour period from 1200 to 2000 hours in the daytime and from 2000 hours and 0400 hours at night. When the night winds are weak, the concentrations are from 1.8 to 19.1 times higher than those of the daytime despite the fact that the automotive traffic volume decreases.

Finally, the correlation between lead concentration and atmospheric lead distribution by altitude from 1.5 meters to 10 meters above the ground and the particle diameter distribution at the height of each of the samplers will be reported on together.

Figure 1



Key:

1 - Fukuda City offices; 2 - Sakai City Health Institute; 3 - lead concentration; 4 - wind velocity.

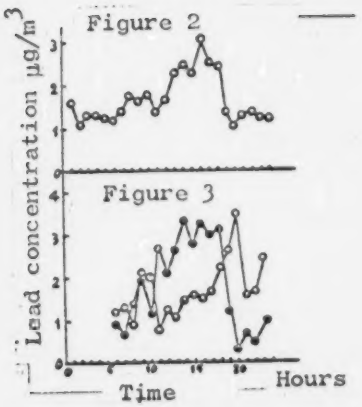


Figure 2
Figure 3
Lead concentration µg/m3
Time
Hours